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Article

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Schmollers Jahrbuch – Zeitschrift für Wirtschafts- und Sozialwissenschaften. Journal of Applied Social Science Studies

Provided in Cooperation with:

Duncker & Humblot, Berlin

Suggested Citation: Hufnagel, Rainer (2003) : The Impact of Domestic Child Care on School Performance, Schmollers Jahrbuch – Zeitschrift für Wirtschafts- und Sozialwissenschaften. Journal of Applied Social Science Studies, ISSN 1865-5742, Duncker & Humblot, Berlin, Vol. 123, Iss. 1, pp. 189-197,
<https://doi.org/10.3790/schm.123.1.189>

This Version is available at:

<https://hdl.handle.net/10419/292048>

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The Impact of Domestic Child Care on School Performance

By Rainer Hufnagel

Abstract

The German Socio-Economic Panel asks respondents every year how much time they spend on child care. The time devoted to children in the past can thus be reconstructed and used as a variable for explaining children's success in primary school. Parents' education and some socio-economic features are used as further explanatory variables. Parents' education and the time mothers spent on child care have a significantly positive effect on primary school results. Implications are discussed in a framework given by the New Political Economy.

JEL Classification: D13, I21.

1. Introduction

The present investigation is concerned with the relationship between family background and school performance. In particular, the impact of time devoted to child care on children's school performance in primary school will be investigated. The analysis is based on the German Socio-Economic Panel (GSOEP) data. The advantage of using GSOEP data is that family history has been surveyed for each year since 1984, and there is no need to rely on retrospective data.¹ The disadvantage is that GSOEP, unlike, for example, the OECD PISA data, was not especially designed to measure children's school performance.²

Investigations of the determinants of children's school attainment are surveyed in Haveman/Wolfe (1995). These studies, however, focus on the United States. Ermisch/Francesconi (2001) use British data, while Büchel/Duncan (1998) and Schimpel-Neimanns (2000) use German data. It appears that only Haveman et al. (1991), using American data from the Panel Study of Income Dynamics, investigate the influence of mothers' care times. They find

¹ Compare here Etzold (2001).

² The PISA data examine national education systems as well as family background and student performance. They are described at www.pisa.oecd.org/knowledge/chap6/a.htm.

that the amount of care the child received from age 4 to age 5 has a significantly positive impact on the probability of the child graduating from high school.

2. The German educational system

Children attend primary school (“Grundschule”) from ages 7 to 10, and secondary school from 11 to 16. There are three kinds of secondary school. “Hauptschule” is an extended elementary school that provides preparation for a vocational career. “Realschule” is a secondary school that provides preparation for a vocational career. “Gymnasium” is an academic secondary school that emphasizes languages or sciences. Students who complete Gymnasium and pass the Abitur exams may enter university. Besides these three main types there are comprehensive schools that integrate Hauptschule, Realschule and Gymnasium, and a large variety of special schools (“Förderschule”) dedicated to the promotion of pupils with various kinds of handicaps.

Teachers recommend children for one of the three types of secondary school at the age of ten, i.e. in the last form of the primary school. In Germany, the best possible mark (grade) is 1, while the worst is 6. In the southern states (Bavaria and Baden-Württemberg), recommendations are based on marks. If marks are worse than 3, then Hauptschule is recommended. If marks are better than 3 and worse than 2.5, Realschule is recommended. For better marks, Gymnasium is recommended. In the other states, recommendations are not binding, but are also based on the child’s performance at school. Hence, if we know what kind of secondary school a pupil attends, we can use this as a measure of success in primary school.

3. GSOEP data used in this investigation

The GSOEP started in 1984. Adults were asked every year about their use of time, including time used in caring for children. This allows the amount of childhood domestic care to be calculated for all children born in 1984 and later. In 2000, all children born before 1990 were more than 10 years old. We can therefore find out whether these children had been recommended for Hauptschule, Realschule or Gymnasium.

Since child care is certainly not the only determinant of children’s success at primary school, we use further household and family-related variables available in GSOEP. These variables are parents’ school leaving qualifications, the child’s sex, whether the child lives in an immigrant household, and the number of hours of employment of the mother. To compute this last variable, the average daily hours of work in each year the child is aged 1 – 10 are summed. Table 1 gives an overview of the variables used.

Table 1
Description of Variables

Variable	Description	Label
Sex	Child's sex	0 = boy ; 1 = girl
Immigrant	Immigrant Household	0 = German; 1 = immigrant
Mother Hauptschule	Mother's secondary school leaving qualification	1 = Mother attended Hauptschule
Mother Realschule		1 = Mother attended Realschule
Mother Gymnasium		1 = Mother attended Gymnasium
Father Hauptschule	Father's secondary school leaving qualification	1 = Father attended Hauptschule
Father Realschule		1 = Father attended Realschule
Father Gymnasium		1 = Father attended Gymnasium
Mother care 0–3	Care received from mother ages 0–3	hours per day per child
Mother care 4–6	Care received from mother ages 4–6	
Mother care 7–10	Care received from mother ages 7–10	
Father care 0–3	Care received from father ages 0–3	
Father care 4–6	Care received from father ages 4–6	
Father care 7–10	Care received from father ages 7–10	
Mother daily work	Mother's labour force participation ages 0–10	Sum of average hours per day in each year

Since computing the child care variables requires valid time-use data for both parents over a ten-year period, many children have incomplete data for these variables, which introduces missing values. Thus, the variables in Table 1 are only completely available for 183 children. There are 1271 children in GSOEP born between 1984 and 1989 and stemming from the samples A and B (the original samples of 1984). 339 of these left the GSOEP before they were 11 years old, so the secondary school attended is unknown. For a further 41 children the pointer to the mother is not available. This leaves 891 children, of whom 598 attend Hauptschule, Realschule or Gymnasium. Of these observations, 216 have complete and plausible mother's time use. Of these, 183 have complete father's time use.

Table 2 shows the descriptive statistics for the remaining 183 children. 35 % of them attend Hauptschule, 27 % attend Realschule and 38 % attend Gymnasium.

Table 2
Descriptive Statistics

Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.	Mean per day in each year
Sex	0.52	0.50	Mother care 0–3	11.06	7.33	3.67
Immigrant	0.24	0.43	Mother care 4–6	7.94	5.42	2.65
Mother Hauptschule	0.40	0.49	Mother care 7–10	8.85	5.84	2.21
Mother Realschule	0.28	0.45	Father care 0–3	2.41	2.90	0.80
Mother Gymnasium	0.13	0.33	Father care 4–6	1.85	2.02	0.61
Father Hauptschule	0.43	0.50	Father care 7–10	2.71	2.58	0.68
Father Realschule	0.18	0.39	Mother daily work	31.28	35.85	3.13
Father Gymnasium	0.18	0.39				

Note: Sample size is 183.

4. Estimation method

To carry out this investigation, an ordered probit is used. Let y be an abstract metric measure for pupils’ performance at primary school. Higher values of y indicate better performance, so in order to think of German marks in this context, one could think of re-ordering marks so that 6 is the best and 1 the worst. Let x be a vector of variables which possibly influence performance y . Let b be a vector of coefficients. Assume a linear relationship between y and x for pupil i :

$$(1) \quad y_i = b^T \cdot x_i + \varepsilon_i .$$

Teachers’ recommendations are mainly based on children’s performance at primary school.

Thus two thresholds A and B ($A < B$) are introduced with the following properties:

- (2) If $y_i < A$ then Hauptschule will be attended.
- If $A < y_i < B$ then Realschule will be attended.
- If $B < y_i$ then Gymnasium will be attended.

Given these assumptions, A, B, and b can be estimated using a maximum likelihood approach.

5. Estimation results

Table 3 gives the estimated results for A, B and the coefficients b using all 15 variables described in section 3. Many of these will turn out to be insignificant. To see which variables are insignificant is, however, interesting in itself.

Table 3

Ordered Probit Results with Full Covariates

Variable	Coefficient (standard error)	α^3	Variable	Coefficient (standard error)	α
A	0.6905 (0.4242)	0.1036	Mother care 0–3	0.0476 (0.0208)	0.0220
B	0.9064 (0.1124)	0.0001	Mother care 4–6	0.0008 (0.0302)	0.9799
Sex	0.877 (0.1891)	0.6427	Mother care 7–10	0.0051 (0.0252)	0.8400
Immigrant	-0.1598 (0.2767)	0.5636	Father care 0–3	-0.0248 (0.0482)	0.6062
Mother Hauptschule	0.7407 (0.3533)	0.0360	Father care 4–6	0.0015 (0.0763)	0.9841
Mother Realschule	1.0630 (0.3839)	0.0056	Father care 7–10	0.0279 (0.0572)	0.6258
Mother Gymnasium	1.6619 (0.4450)	0.0002	Mother daily work	0.0008 (0.0029)	0.7706
Father Hauptschule	-0.8287 (0.3368)	0.0139			
Father Realschule	-0.0252 (0.3751)	0.9464			
Father Gymnasium	0.4382 (0.4063)	0.2808			

Notes: Sample size is 183. Adjusted pseudo-R² is 0.107.

³ Probability of making an error when rejecting the hypothesis that the coefficient is 0.

Table 3 shows that the child's sex has no significant influence on his or her success at school. The same holds for the immigrant status. In general, the coefficients on the variables indicating parents' education are significant (the omitted education category is incomplete or non-standard secondary school). Sometimes, however, they have an unexpected, but insignificant sign. This might be due to the low number of cases.

Among the parents' time use variables, only mother's child care hours for age 0–3 is significant. Note that Mother daily work is insignificant too. It seems that the mother's working hours are not so important, and what matters is the time devoted to the infant. Fathers' child care times are insignificant. Looking back to Table 2, we see that the reason cannot be that their mean or their variance is too small. How the difference in fathers' and mothers' time use occurs might be explained must be left for further research.

It is possible that some of the variables in the specification of Table 3 are collinear. For example, immigrants typically have parents with low education, so it may not be possible to identify the coefficient on immigrant status separately. To remedy this, the insignificant variables Sex, Mother daily work, Immigrant, Father care 0–3, Father care 4–6, and Father care 7–10 are deleted. The variables giving information on the parents' education and mother's time use are combined. As fewer variables are considered, the number of observations lost to missing values decreases and hence the sample size increases. We thus define dummy variables with a value of one if the parent's education is "high" (the parent attended Gymnasium), and zero if the parent attended Hauptschule or Realschule. We also define "Mother care 0–10" to be the sum of Mother care 0–3, Mother care 4–6 and Mother care 7–10.

Using these variables gives the results shown in Tables 4 and 5. Table 4 is based on the sample of 183 observations used in Table 3, while Table 5 is based on a larger sample of 216 observations. The expansion of the sample is made possible by the reduction in the number of variables used.

Table 4

Ordered Probit Results with Fewer Covariates

Variable	Coefficient (standard error)	α
A	0.3036 (0.1877)	0.1057
B	0.8209 (0.1022)	0.0001
Mother high education	1.0714 (0.3269)	0.0010
Father high education	1.0312 (0.2613)	0.0001
Mother care 0–10	0.0177 (0.0059)	0.0026

Notes: Sample size is 183. Adjusted pseudo-R² is 0.103.

Table 5

Ordered Probit Results with Reduced Covariates and Expanded Sample

Variable	Coefficient (standard error)	α
A	0.1537 (0.1714)	0.3698
B	0.8003 (0.0926)	0.0001
Mother high education	1.1350 (0.2881)	0.0001
Father high education	1.0305 (0.2545)	0.0001
Mother care 0–10	0.0121 (0.0052)	0.0186

Notes: Sample size is 216. Adjusted pseudo-R² is 0.100.

It can be seen that deleting and recombining variables leads to convincing levels of significance. The coefficients of Table 5 can be easily interpreted. A represents the Hauptschule-Realschule threshold, while B represents the Realschule-Gymnasium threshold. The difference is $B - A = 0.6466$. This corresponds nearly to the difference in marks of 0.5 between the Hauptschule-Realschule and Realschule-Gymnasium cutoffs used in southern Germany. Thus, we can scale the coefficient estimates by $0.5/0.6466$ to interpret them as marks.

A child with two parents of high education will have a performance 1.7 points $(1.13 \cdot 5 + 1.0305) \cdot (0.5/0.6466)$ higher than a child with two parents of low education: this is a very large effect on a scale of 1–6. The mean of the variable Mother care 0–10 is 28.7, while its standard deviation is 16.7. Multiplying this standard deviation by the coefficient 0.0121 (and by $0.5/0.6466$) yields 0.16. An increase of one standard deviation in mother's child care thus increases a child's marks by 0.16. This is much less than the effect of parents' education, but nevertheless it is not negligible.

If we believe that children's success at primary school is partly produced by their families, we could say that it is produced by capital (i.e. parents' human capital) and labour (i.e. parents' child care times). The results of this investigation show that this production is rather capital-intensive.

6. Discussion

This investigation has shown that family and household conditions play an important part in children's success at primary school. Parents' human capital and their efforts in caring for children improve primary school marks. Germany's educational shortcomings, recently documented by the OECD assessment (Deutsches Pisa-Konsortium 2001), cannot be overcome merely by looking at

the efficiency of kindergartens, schools and universities. Plans to remedy the problem must include family and social policies.⁴ Moreover, in the author's opinion, what is needed is an analysis of the present situation that uses methods of the New Political Economy. In the following, an attempt is made to give a preliminary outline for such an analysis.

Suppose there are two groups of parents. Group A with higher education levels and group B with lower education levels. Group B parents' should have an objective interest in improving the public educational system. The improvement should be able to compensate differences in the home production of human capital.

Group A parents' interests are ambiguous in a variety of respects. High education leads to high wages and salaries. So they are interested in labour force participation and hence interested in an excellent public educational system. However, an average or bad standard of public education improves the relative performance of their children, because group A is better at compensating for deficits in school education than Group B, as this investigation shows. But producing good marks also involves time, and this goes against group A's interest in labour force participation.

Why not then send the children to private schools? These are rare in Germany. Obviously German schools – according to PISA slightly below the OECD average – are not bad enough to make parents willing to pay fees. Additionally, being educated must not necessarily mean that parents are wealthy enough to pay for children's education.

Lobbying for schools takes time. Parents, especially young parents, are short of time, because children and professional career demand a lot of energy. Generally speaking, it will be better to invest the scarce time available in one's own children and not in political activities. If children are older and the parents' career is established, then improvements in the educational system will no longer help their own children. Now there is little interest in lobbying.

Decisions about German kindergartens, schools and universities are made in the towns and the states, not far away in Brussels. So it should be relatively easy to bring about improvements in this field. Promoting these improvements should be the task of group A. They have the contacts to the local and state politicians, they have the eloquence to convince them, they have the experience from profession, travel and the media to know that things cannot stay as they are. However, there seem to be two main obstacles. Firstly, the majority of people are not parents of school age children. Therefore group A and group B at least would have to form an alliance. Secondly, group A in particular has ambiguous interests, as shown above.

⁴ Compare here Ott (2002).

Analysing Germany's educational shortcomings in a framework of the New Political Economy thus suggests the following. Firstly, group A parents should become aware of the ambiguity of their interests and resolve it. Secondly, for demographic reasons, at least an alliance with Group B parents (and with grandparents) is needed. Therefore thirdly, improvements must take account of the interests of group A and group B, i.e.: the absolute performance of group A children must be improved, as must the relative performance of group B children.

7. Conclusions

The econometric part of this investigation has shown that investing time in one's own children will not be without success. It has further shown that human capital can be passed on. In the author's opinion, the first gives the parents the right to require improvements in public education. The second gives them the responsibility to take action to bring about improvements, for it should be remembered that the current adults' good education has been given to them by society mainly free of charge.

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